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ABSTRACT

This curriculum guide is designed for the student interested in preparing for vocational electronics and related fields of electricity, emphasizing the mathematics necessary for an indepth study of electronics. Included in the course content are goals, specific block objectives, basic algebra, powers of 10, the slide rule, basic trigonometry related to vector analysis, and logarithms. Posttest samples and a bibliography are included. (NH)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

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Course Outline
INDUSTRIAL ELECTRONICS 1 - 9323
RADIO AND TELEVISION SERVICE 1 - 9783
MATH - 5214
(Math for Electronics)
Department 48 - Quin 9323.04, 9783.04 and 5214.92

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1973

ED 097498

D A D E C O U N T Y P U B L I C S C H O O L S

1 4 5 0 N O R T H E A S T S E C O N D A V E N U E

M I A M I, F L O R I D A 33132

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Dade County Public Schools
Miami, Florida 33132

May, 1973

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Course Description

9323 9783 5214		9323.04 9783.04 5214.92	Math for Electronics
State Category	48 County Dept.	County Course	Course Title

Designed for the student interested in the preparing for vocational electronics and related fields of electricity. It contains units in slide rule, powers of 10, basic algebra, basic trigonometry related to vector analysis and logarithms related to decibels.

One quinmester credit.

Clock Hours: 45

PREFACE

The following pages contain a course outline entitled Math For Electronics. This is a quinmester course to provide the necessary math before continuing an in-depth study of electronics.

Upon completion of this course the student will have a good foundation in the following as it is applied to an in-depth study of electronics:

Basic algebra, powers of 10, slide rule, basic trig, and logarithms.

This course of study will be covered in six blocks and completed in 45 clock hours.

The teaching methods will vary according to the ability of the individual student. The instructor will use the lecture and demonstration methods which are supplemented by assignments to the students.

This outline was developed through the cooperative efforts of the electronic instructors, supervisory personnel, the Quinmester Advisory Committee, and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

TABLE OF CONTENTS
with Suggested Hourly Breakdown

	Page
PREFACE	i
GOALS	iii
SPECIFIC BLOCK OBJECTIVES	iv
BIBLIOGRAPHY	3
BLOCK	
I. BASIC ALGEBRA (8 Hours)	
Definition of Algebra	1
Positive and Negative Numbers	1
II. POWERS OF 10 (5 Hours)	
Definition	1
Multiplication with Powers of 10	1
Division of Powers of 10	1
Combined Multiplication and Divisions	1
Reciprocals of Powers of 10	1
Power of a Power	1
Root of a Power	1
III. SLIDE RULE (18 Hours)	
Description of Slide Rule	1
Multiplication with C and D Scales	2
Division with C and D Scales	2
Reciprocal with C and C^1 Scales	2
Proportion with C and D Scales	2
Square and Square Root with A and D Scales	2
IV. BASIC TRIG RELATED TO VECTOR ANALYSIS (7 Hours)	
Trigonometric Functions	2
Determine Angles by Use of Ratios	2
Application of Ratios to Add Vectors	2
V. LOGARITHMS (7 Hours)	
Definition	2
Notation	2
Characteristics	2
Mantissa	2
Use of the Logarithm Table	2
The Antilog	2
The Decibel	2
VI. QUINMESTER POST-TEST	
APPENDIX: QUINMESTER POST-TEST SAMPLES	5

GOALS

The student must be able to:

1. Demonstrate an understanding of powers of 10 and the slide rule.
2. Demonstrate an understanding of basic trig as applied to the addition of vectors.
3. Demonstrate an understanding of logarithms as applied to computing decibels.
4. Satisfactorily complete the quinmester post-test.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - BASIC ALGEBRA

The student must be able to:

1. Define in writing general or literal numbers.
2. Solve assigned problems adding and subtracting positive and negative numbers.
3. Solve assigned problems adding and subtracting like terms.
4. Solve assigned problems multiplying P and N numbers.
5. Solve assigned problems in division of P and N numbers.

BLOCK II - POWERS OF 10

The student must be able to:

1. List in writing the rule to express decimals as a whole number.
2. List in writing the rule to express whole numbers as decimals.
3. Solve assigned problems multiplying with powers of 10.
4. Solve assigned problems dividing with powers of 10.
5. Solve assigned problems finding reciprocals with powers of 10.
6. Solve assigned problems finding the power of a power.
7. Solve assigned problems finding the root of a power.

BLOCK III - SLIDE RULE

The student must be able to:

1. Solve assigned problems in multiplication on the slide rule.
2. Solve assigned problems in division on the slide rule.
3. Solve assigned problems in proportions on the slide rule.
4. Solve assigned problems in reciprocals on the slide rule.
5. Solve assigned problems in square and square root on the slide rule.

BLOCK IV - BASIC TRIG RELATED TO VECTOR ANALYSIS

The student must be able to:

1. Define in writing the terms of the sides of a triangle.
2. List in writing the ratios of an angle.
3. Solve problems related to the application of the ratios of an angle.
4. Solve problems of adding vectors by use of the ratios of an angle.

BLOCK V - LOGARITHMS

The student must be able to:

1. Determine the characteristic of a logarithm.
2. Determine the Mantissa of a logarithm.

3. Solve problems finding the decibel value of power and voltage ratios.
4. Define in writing the reference levels used in decibels.

BLOCK VI - QUINMESTER POST-TEST

The student must be able to:

1. Satisfactorily complete the quinmester post-test.

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MATH - 5214
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I. BASIC ALGEBRA

A. Definition of Algebra
   1. General or literal numbers
   2. The formula
      a. Signs of operation
      b. Order of signs of operation
      c. Algebraic expressions
      d. The product
      e. The factor
   3. Primes and subscrips

B. Positive and Negative Numbers
   1. Addition of P and N numbers
   2. Subtraction of P and N numbers
   3. Addition and subtraction of like terms
   4. Addition and subtraction of polynomials
   5. Signs of grouping
   6. Multiplication of P and N numbers
   7. Division of P and N numbers

II. POWERS OF 10

A. Definition
   1. Form
   2. Rule to express decimal as whole number
   3. Rule to express whole number as decimal

B. Multiplication With Powers of 10

C. Division With Powers of 10

D. Combined Multiplication and Division

E. Reciprocals With Powers of 10

F. The Power of a Power

G. The Root of a Power

III. SLIDE RULE

A. Description of Slide Rule
   1. Types
   2. Parts

3. Accuracy
   a. Rounded numbers
   b. Decimals
   c. Significant figures

B. Multiplication With C and D Scales

C. Division With C and D Scales

D. Reciprocal With C and C^1 Scales

E. Proportion With C and D Scales

F. Square and Square Root With A and D Scales

IV. BASIC TRIG RELATED TO VECTOR ANALYSIS

A. Trigonometric Functions
   1. Defined terms of the sides of a triangle
   2. Sides of a triangle related to one of the acute angles
   3. Ratios of an angle
   4. Definition of the angle θ

B. Determine Angles by Use of Ratios
   1. Solve for the angle θ with two sides given
   2. Solve for the hypotenuse with two sides given
   3. Solve for the hypotenuse with one side and the angle θ

C. Application of Ratios to Add Vectors

V. LOGARITHMS

A. Definition

B. Notation

C. Characteristics
   1. Rule for determining positive characteristic
   2. Rule for determining negative characteristic
   3. Power of 10 as the characteristic

D. The Mantissa

E. Use of the Logarithm Table

F. The Antilog

G. The Decibel
   1. Power and voltage ratios
   2. Formula for power ratios
   3. Formula for voltage and current ratios
   4. Reference levels

VI. QUINMESTER POST-TEST

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Basic References:

1. Cooke, Nelson M., Basic Mathematics For Electronics. 2nd ed., New York: McGraw-Hill, Inc., 1960. Pp. 679.

Supplementary References:

2. DCPS - Mathematics for Electronics. Pp. 101.

3. Slade, Samuel, Mathematics for Technical and Vocational Schools. 4th ed., New York: John Wiley and Sons, Inc., 1955. Pp. 574. (Dolcroni, Freelich, Berman)

4. Meder, Albert Jr., Modern Algebra, Book One. Boston: Houghton Mifflin Company, 1961. Pp. 552.

A P P E N D I X

Quinmester Post-Test Samples

QUINMESTER POST-TEST

Name_____ Date_____ Score_____

1. Eighteen resistors cost a total of $6.30.

   (a) What is the cost of each resistor?
   (b) What is the cost of x resistors?

If R=4, Y=2, and X=6, find the value of the following:

2. R + Y

3. $\frac{X}{Y}$

4. $\frac{X-Y}{R}$

Add P and N Numbers:

5. 37
   -23

6. -76
   41

7. -14
   -57

8. -93.04
   .03
   - 3.25

Subtract P and N Numbers:

9. 45
   -93

10. -36
    68

11. -436
    -209

Multiplication of P and N Numbers:

12. 6 x -8 =

13. (-N) X (-M) X (X) =

    -5 X -3 =

14. 3000 X -.04 X 180 X -.0035

5/6/-7-

Division of P and N Numbers:

15. $+24 \div +6 =$

16. $-24 \div -6 =$

17. $E^2 \div -R =$

18. $-14 \div -7 =$

Power of 10 - Express in numbers between 1 and 10 times the proper power of 10

19. $.00025 \times 12 \times 10^{-6} \times 19 \times 10^{3}$

20. $.432 \times 8{,}350{,}000 \times 10^{-3} \times 5.63 \times 10^{3} =$

21. $X_L = 2\pi FL$, L = .5 Henry F = 400 cycles

22. $102{,}000 \div .000034 =$

23. $(.000256 \times .000000338) - 865{,}000{,}000 =$

24. 6845

25. .000000009435

26. 276×10^{-6}

27. $.010274 \times 10^{-8}$

Trig:

28. Write the sin, cos, and angle for an angle whose tan is 3/4

29. A network has a loss of 16 DB. What power ratio corresponds to this loss?

30. How much power is represented by a gain of 23D3 if ODB = 6 MW

31. An amplifier has an input resistance of 200 and an output resistance of 6,400. When .5 volt is applied across the input, a voltage of 400 V appears across the output.

    a. What is the power output of the amp?
    b. What is the gain in DB?

ANSWER KEY TO QUINMESTER POST-TEST

1. a. 35¢, b. 35X
2. 6
3. 3.
4. 1
5. +14
6. -35
7. -71
8. -96.26
9. +138
10. -104
11. -227
12. -48
13. +NMX, +15
14. 75.6
15. 4
16. +4
17. $-\frac{E^2}{R}$
18. +2
19. 5.7×10^{-5}
20. 2.03×10^{7}
21. 1.26×10^{3}
22. 3×10^{9}
23. 1×10^{-19}
24. 6.845×10^{3}
25. 9.435×10^{-9}
26. 2.76×10^{-4}
27. 1.0274×10^{-10}
28. sin 3/5, cos 4/5, 36.60
29. 39.8 to 1
30. 1,197 MW
31. a. 25W, b. 43 D